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Roadless Area Conservation

National Forest System Lands in Idaho

VEGETATION SPECIALIST REPORT

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ABSTRACT

This report provides background and information analysis for the affected environment and environmental consequences of the alternatives analyzed for the Roadless Area Conservation; National Forest System Lands in Idaho (DEIS), December, 2007. It covers the affected resource environment, assumptions, data and analytical methods used, and the analysis of effects for forest vegetation, timber harvest/cutting, forest health, noxious weeds and climate change that are summarized and disclosed in Chapter 3 of the DEIS.

Inventoried roadless areas comprise approximately 9.3 million acres in Idaho, or approximately 45 percent of National Forest System (NFS) lands within the state. Inventoried roadless areas have inherent characteristics and values that are becoming scarce in an increasingly developed landscape nation-wide. In Idaho, inventoried roadless areas represent about 17 percent of the total land base. Inventoried roadless areas provide significant opportunities for dispersed recreation, sources of public drinking water, and large undisturbed landscapes that provide privacy and seclusion. In addition, these areas serve as bulwarks against the spread of invasive species and often provide important habitat for rare plant and animal species, support the diversity of native species, and provide opportunities for monitoring and research. For a more complete description of the background of the proposal, see Chapter 1, Purpose of and Need for Action, in the DEIS.

Annual timber offer volumes under the proposed action (Idaho Roadless Petition) are estimated to average 4 million board feet (MMBF) annually as a result of direction contained in the 5 management themes within inventoried roadless areas. This compares to estimated offer volumes of .5 MMBF for the 2001 Roadless Rule, and 14 MMBF for Existing Forest Plans.

Approximately 1.4 million acres of inventoried roadless acres are estimated at risk of serious insect and disease caused mortality. This is approximately 15 percent of the inventoried roadless acres in Idaho. This compares to an estimate of approximately 3.5 million acres at risk state-wide.

Noxious weed species have been inventoried on over 28 thousand acres of the State's Inventoried roadless areas, or approximately .3% of total roadless acres. Not all of the acres in Inventoried roadless areas have been inventoried. For NFS lands within the State of Idaho, approximately 223 thousand acres of noxious weeds have been inventoried.

Climate change is an important issue globally, nationally and regionally. Idaho's forests are an important source of carbon storage. Global climate changes have the potential to change the amounts of stored and released carbon, as well as other factors relating to forest communities and plant species, such as fire

frequency and forest health. The actual magnitude of effects is currently uncertain.

Methodology and Information Used

Forest Vegetation

The Forest Inventory and Assessment (FIA) data base (Miles, 2007) was used to estimate the extant of forest cover types, and to display forest attributes, including volumes, size class, growth and mortality. This information was used at both the state and national forest scales. The most recent FIA inventory reflects FIA plot measurements on over 700 plots from 2004 and 2005, or 20% of the total plot grid. This information is updated annually; values for these attributes will change as additional plots are surveyed (10% plots inventoried yearly). While the current inventory is not complete, it does reflect general forest attributes that are usable for general context at the state and national forest land ownership scale.

FIA Cover Type Map was used to approximate the distribution of forest types in the inventoried roadless areas of the state. This information was used, in lieu of the inventory, because the inventory is not sufficient at this time to accurately reflect the existing cover types within these areas. As the inventory measures additional plots, this information will become more reliable.

The existing vegetation was used in conjunction with the forest health information to provide context and projections of risks from insect and disease agents that affect various tree species that constitute forest types.

Timber Harvest and Cutting

Timber cutting is defined here as any cutting of any trees for management purposes. Timber harvest is defined as the removal of trees for wood fiber use and other multiple-use purposes (Forest Service, 2006a). Timber cutting is the broader term, and encompasses timber harvest. Timber cutting, exclusive of timber harvest, could be used to support activities such as prescribe burning and timber stand improvement. However, due to the cost of these activities and public controversy within inventoried roadless areas, such cutting is projected to be limited.

Effects on national forest timber harvest in Idaho were compiled and evaluated using volume data provided by the national forests in 2001 for (1) volume sold within inventoried roadless areas during FY 93-99 and (2) estimated volume planned for removal within inventoried roadless areas over the short term (FY 00-04) for existing forest plans, and (3) actual volume sold within inventoried roadless areas from 2001-2006 and projected from 2007-2011 implementing the roadless rule from 2007 data.

Projected annual volumes for the Idaho Roadless Petition were estimated from the volume sold during FY 93-99, plus the estimated planned volume offer for 2000-2004, using the roadless rule as a baseline. Volumes attributable to the General Forest theme were reduced by the proportional acre reduction in General Forest from existing forest plans. The harvest volumes for areas to be managed under the Backcountry/Restoration theme are estimated to be the same as the 2001 Roadless Rule. These estimates also reflect the generally high cost and difficulty of timber harvest associated with roadless areas.

Forest Service Cut and Sold volume reports were used for the State of Idaho, 2002-2006. The Timber Information Management database (Intermountain Region) and Timber Program Statistics (Northern Region) was used for sale information.

Forest Health

Forest health effects analysis relied on forest insect and disease risk mapping data, compiled and assessed by the Washington Office Forest Health Protection Staff. For this analysis, the 2006 version was used. A coarse, state and national forest ownership assessment of the effects of disease and insect high-risk areas within inventoried roadless areas on the national forests was completed using GIS overlay results provided by the Washington Office Remote Sensing and Application Center.

Additional information was summarized from annual forest health highlights from 2004 to 2006 for the state of Idaho. This information is published by the Intermountain and Northern Region Forest Health Protection Unit, in cooperation with the Interior West Forest Inventory and Assessment office of the Rocky Mountain Research Station (FIA). These results reflect the annual aerial detection flights for 2002-2003, and 2005-2006.

Noxious Weeds

The Idaho State Department of Agriculture (ISDA) noxious weed inventory layer (ISDA, 2007) was used to display and analyze the noxious weed infestations within the inventoried roadless areas. Information was provided at national forest scale and inventoried roadless areas for context. This inventoried map is based upon reported noxious weed occurrences to ISDA by the national forests in Idaho.

Carbon storage and Climate Change

A literature review was conducted to provide recent information related to global climate change and carbon storage.

Assumptions

Forest Vegetation

The FIA Data base (Miles, 2007), is adequate to provide broad-scale inventory information for context at both the state and national forest ownership scale.

The FIA cover type map is adequate to provide estimated distribution and percentage of forest types within the inventoried roadless areas.

Forest Health

Forest health risk map is adequate to describe broad-scale conditions of Idaho's forests, and provides the best information available for forest health conditions across the state and national forests and inventoried roadless areas.

Insect and disease detection flights provide adequate context on past and current damages for selected forest cover types at the state scale.

Timber Harvest and Cutting

Table 1. Projected timber cutting by alternative

Projected timber cutting	2001 Roadless Rule	Existing Forest Plans	Idaho Roadless Petition
timber harvest yearly average (MMBF)	0.5	14	4
timber harvest yearly average (acres)	100	2,800	800

All alternatives:

- Any timber cutting under any alternative would be designed based on applicable forest plan standards and guidelines (e.g. protection of riparian areas, habitat needs for species, etc).
- Under the projections for the Existing Forest Plans, which reflect the level of harvest in the 1990s, about 42,000 acres of the inventoried roadless areas (table 1) could be harvested with a full array of methods (including even-aged, uneven-aged and intermediate harvests) over the next 15 years which is about a half percent the roadless lands in Idaho.
- Other timber cutting, such as slashing for prescribed burns, could be done. Acres associated with this type of cutting are not reflected in the table above (table 1) because it doesn't include a merchantable product. This type of activity is likely limited because of cost.
- Most future timber harvest done within inventoried roadless areas would accomplish some measure of forest health improvement, such as fuels reduction or treatment of insect or disease outbreaks.

- Where timber cutting, sale, and removal activities are prohibited, vegetation management activities – such as slashing, brush removal and prescribed burns – are allowed and anticipated to be infrequent.

2001 Roadless Rule:

- Timber cutting generally removes smaller diameter and maintains or improves roadless characteristics.
- Shelterwoods, uneven-age management or intermediate harvests could occur. All would retain some structure and canopy and would be less evident on the landscape, especially over time. All treatments would focus the removal of smaller diameter trees and retain the overstory.
- Timber cutting infrequent.

Existing Forest Plans:

- Timber cutting done to address a variety of resource issues and included all silvicultural tools (including timber stand improvement practices, even-aged, uneven-aged regeneration methods and intermediate harvests) are available.
- No requirement to maintain or improve roadless area characteristics.
- Timber cutting more frequent in management prescriptions similar to general forest, less frequent in areas similar to the Backcountry/Restoration theme.

Idaho Roadless Petition:

- Timber cutting in primitive would rarely be done and would maintain roadless characteristics.
- Timber cutting in Backcountry/Restoration would be done on a limited basis and would retain roadless characteristics. Cutting would be for stewardship purposes (fuels reduction, forest health) and would be light on the land (focusing on what is left behind, not what is removed). There would be no clearcut or seedtree harvests. Shelterwoods, uneven-age management or intermediate harvests could occur. All would retain some structure and canopy and would be less evident on the landscape, especially over time. There would be no cutting just for timber purposes. Intent is to only to do what is necessary to address the need, not for timber production purposes.
- Timber cutting more frequent in general forest, less frequent in Backcountry/Restoration, and infrequent in primitive.
- In General Forest, roadless characteristics would not have to be retained – but often would be. Full range of silvicultural techniques could be used – including clear-cutting when the situation warrants it.

ROAD CONSTRUCTION/RECONSTRUCTION

Table 2. Projected road construction/reconstruction; yearly average by alternative

Projected road construction/ reconstruction activities; yearly average	2001 Roadless Rule	Existing Forest Plans	Idaho Roadless Petition
Permanent - other	0.8	0.8	0.8
Temporary - other	0.2	0.2	0.2
Reconstruction - other	0.0	0.0	0.0
Total	1.0	1.0	1.0
Permanent – timber	0	4	0.0
Temporary – timber	0	2	1.5
Reconstruction - timber	0	5	1.5
Total	0	11	3
Decommissioning	1	4	3

All Alternatives:

- Historic trends for developing inventoried roadless areas established over the past 20 years, under Existing Forest Plans would continue into this century. Currently, it is estimated that in areas allowing road development, less than 5% has been roaded. This represents less than 1% of the total roadless acres.
- High geothermal potential in the inventoried roadless areas would see limited road development within the planning horizon due to the availability of geothermal potential in more accessible areas.
- Roads developed to support timber harvest would generally be closed after the entry. Temporary roads constructed for timber harvest would be decommissioned as part of the contract package.
- Any road construction/reconstruction under any alternative would be designed based on applicable forest plan standards and guidelines.
- Road numbers for other activities are for actions such as access to rights-of way, locatable minerals and phosphates. They may also include an incidental amount for recreation or other needs.

2001 Roadless Rule:

- Road construction/reconstruction only done for reasons other than timber harvest (7 exceptions allowed in the rule).

- About 1 mile of road constructed annually for purposes other than timber harvest. About 80% of the roads were permanent because they were for valid existing rights; 20% were temporary roads (table 2).

Existing Forest Plans:

- About 12 miles constructed annually; of which 1 mile was construction/reconstruction done for reasons other than timber. For the 11 remaining miles about 48% of road totals was reconstruction; 40% new permanent roads; and 12% temporary (table 2).
- Permanent roads generally closed after activities.

Idaho Roadless Petition:

- About 1 mile of yearly road construction/reconstruction would be done for reasons other than timber harvest. About 80 % is new construction, of which 20% are temporary in nature.
- Of the remaining 3 miles of roads needed for timber cutting, about 50% is reconstruction (about 1.5 miles); and 50% new construction (1.5 miles) which would be in the form of temporary roads. (This assumption is based on the states emphasis for temporary roads) (table 2).

Noxious Weeds

Noxious weeds are correlated to site disturbances that produce bare mineral soil, including activities associated with timber cutting, prescribe fire, road construction/reconstruction, and mineral activities.

Appropriate noxious weed strategies and treatments, as authorized by individual Forest's NEPA decision document, are used to control noxious weed infestations when such activities occur.

Carbon Storage and Climate Change

Climate change is currently occurring and will continue into the future.

Uncertainty in the magnitude, rapidity, and landscape effects are recognized concerning climate change.

Affected Environment

Over 21.4 million acres of the total Idaho land area consists of forest land, which is land that is at least 10 percent stocked, or formerly having such cover, by forest trees of any size and not currently developed for non-forest use. These forests vary from the very dry pinyon-Juniper woodlands to cold alpine forest types at high elevations. Approximately 76% of the forest land in Idaho is administered

by national forests. Table 3 displays the approximate forest type acreage in the state and within national forests in Idaho.

Table 3. Forest Cover Types for State of Idaho and National Forests in thousand of acres[1]

Forest Type	State	National Forest
Pinyon/Juniper	739	143
Douglas-fir	6,543	5,296
Ponderosa pine	1,539	1,076
Spruce-fir[2]	3,826	3,426
Lodgepole pine	2,273	2,095
Grand fir/Cedar/hemlock[3]	3,182	1,792
Western larch	167	100
Other Softwoods	473	458
Aspen/Birch/Cottonwood	862	541
Other Hardwoods	207	106
Nonstocked	1,621	1,348

[1] *Forest Inventory Analysis data base (Miles 2007)*
[2] *Includes mountain hemlock*
[3] *Includes western white pine*

The predominant forest types in the state are Douglas-fir (31%), Spruce-fir (18%), Grand fir /Cedar/hemlock (15%), and lodgepole pine (11%). The tree species found in these forests are generally similar to those that would have existed prior to European settlement, however, extant of individual forest types and species has changed substantially in some areas. Examples of forest types that have increased from historic conditions include Douglas-fir and the moist grand fir and hemlock forests of north Idaho. Those forests that have reduced acreage compared to historic conditions include ponderosa pine, western larch, western white pine, whitebark pine. Douglas-fir has been reduced in coverage in the Central Idaho Mountains, and aspen has had steep declines in Eastern Idaho (Quigley, 1997, pages 629, 888, 890 & 892). Wildfire suppression, introduced exotic diseases (i.e. white pine blister rust), and past harvesting practices all contributed to these shifts in cover type amounts.

Acres of forest cover types from the forest inventory for roadless areas are not currently available (Ruefenacht et al). However, a cover type map, modeled from the inventory data, is available. The cover type map appears to overestimate certain cover types (e.g. Douglas-fir). Noting this difference, the inventoried roadless area cover type abundance is approximately 40% Douglas-fir, 20% spruce-fir, and lodgepole at 8%. All other forest types are less than 5% each. The non-forest types within the inventoried roadless areas are estimated to be 18%, including other vegetation types (grasslands, shrublands, meadows, etc.), and barren areas (rock, ice, etc.)

Approximately 16.2 million acres of forest land in Idaho are considered timberlands, or those non-reserved lands (not withdrawn from timber

production by statue or regulation) that are capable of growing 20 cubic feet per acre per year or more of wood. The most recent inventory for the state (2004-2005)[4] estimates net volume of sawtimber trees at 189 billion board feet, an average annual net growth of over 4 billion board feet, with average annual mortality of 1.7 billion board feet over the same time period. Approximately 80% of the net volume, 65% of the net growth, and 94% of the mortality occurs on national forest lands (Miles, 2007).

Most of Idaho's timberlands are 9 inch average diameter or more (68%), with the 5-8.9 inch class (10%), and those less than 5 inch diameter stands (17%). Non-stocked areas contribute the remaining 5% of the size class total. National forest size classes are similar to the state averages (Miles, 2007).

A complete inventory for of old growth forests (also termed late successional forests) is currently not available across all national forest lands in Idaho. These forests form a portion of the acres within the 9 inch and more size class above.

TIMBER HARVEST

From 1947 through the late 1960's, harvest on all forest lands nearly doubled, from 950 million to 1.8 billion board feet. National forest lands were the primary contributor to the increase, quadrupling harvest from 250 million to over 1 billion board feet in 1969. During this time, the harvest from national forests increased from less than 30% of the total harvest in the 1960's to 60% in the late 1960's. Timber harvest peaked in Idaho in 1976 at 1.9 billion board feet. At the same time, harvest from national forests declined slightly, the difference came mostly from private timberlands. National forest harvests contributed 50% of the total harvest at that time (Morgan et. al, 2004).

The 1980's saw a sharp decline in total harvest, as the timber industry went into depression. By the late 1980's harvest had recovered to an average level of 1.635 billion board feet, but national forest contributions had been reduced to 45%. Harvest from private lands increased to 45%, other public lands to 10% (Morgan et. al, 2004).

The volume of timber on all forest lands in Idaho has declined since the early 1990's and has continued since 2002, when the latest state-wide data was available. During this period, national forest timber harvest levels declined to only 7% of the total harvest within the state, or approximately 73 million board feet. The proportion of the private lands contribution continued to increase to 72% of the total harvest by 2001. The remainder of the harvest was from other public lands (Idaho Department of Lands and Bureau of Land Management) for

[4] 2nd measurement of 10 year annualized cycle. 10% of the states plots are inventoried each year. Currently, over 740 plots have been measured.

about 21% of the total harvest (Morgan et. al, 2004). Figure 1 displays harvest trends in Idaho from 1949 to 2001 (from Morgan et. al, 2004).

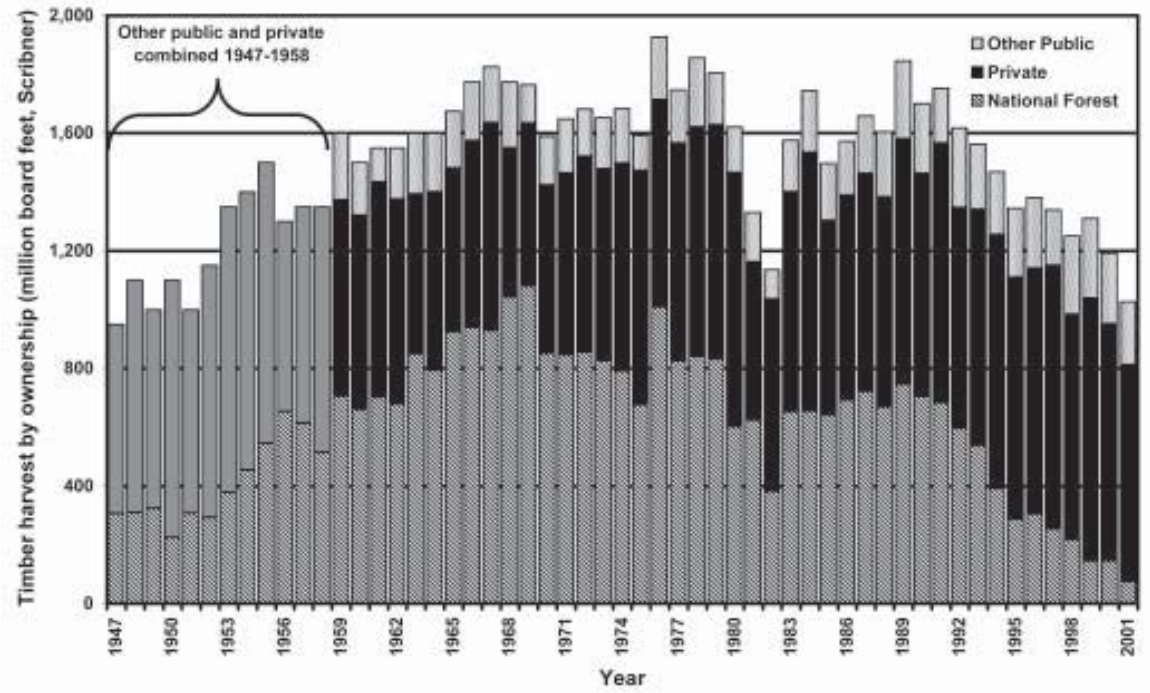

Figure 1. Timber harvest by ownership; by year

National forest harvests have been fairly consistent for the period of 2002 to 2006, averaging 122 million board feet per year (USDA Forest Service, Intermountain and Northern Region Cut and Sold Reports, 2002-2006), occurring on average 9,928 acres per year (USDA Forest Service, Intermountain and Northern Region data bases, 2002-2006).

Approximately 16.2 million acres of forest land in Idaho are considered timberlands, or those non-reserved lands (not withdrawn from timber production) that are capable of growing 20 cubic feet per acre per year or more of wood. The Forest Service manages approximately 12 million acres of timberland within the state (74% of the state total). The most recent inventory for the state (2004-2005) estimates net volume of sawtimber trees at 189 billion board feet, an average annual net growth of over 4 billion board feet, with average annual mortality of 1.7 billion board feet over the same time period. Approximately 88% of the mortality occurs on national forest lands (Miles, 2007).

Not all timberlands within National Forests are considered suitable for timber production. Lands that are suitable for timber production are those that are capable of reforestation within 5 years of harvest, able to be harvested without irretrievable damage to soils or watershed, and are not in an area reserved by Congress or otherwise determined to be unavailable for timber production. Responsible officials may establish timber production as a multiple-use land

management plan objective for lands where costs of timber production are justified by the ecological, social, or economic benefits.

ASQ is the quantity of timber that may be sold from a national forest as determined by the forest land management plan during the period specified by the plan. It is usually expressed as an average annual volume which may be sold from the forest's suitable (for timber production) land base. Timber may be sold from lands that are not identified as suitable for timber production in the land management plan if necessary to achieve desired vegetation conditions; however, this volume is generally not included within the ASQ.

As land management plans have been revised, a trend of substantial decreases in ASQ has been appearing. Table 4 summarizes this information for forests in Idaho that have revised land management plans as of 2007. The Clearwater, Idaho Panhandle and Nez Perce are currently revising their plans. Planned timber harvest volumes from these forests are likely to decrease from the original plans also. As land suitable for timber production and timber harvest limitation volumes continue to decrease, it is likely that timber harvest volume from non-suitable lands will increase to meet fuel reduction and other non-timber vegetation management objectives of land management plans.

Table 4. Changes in allowable sale quantity (ASQ) in recent land management plan revisions.

Region	Forest	Year plan revised	Previous ASQ (MMBF [4])	New ASQ (MMBF)	Reductions (%)
Intermountain	Targhee	1997	86	8	-91
	Boise	2003	85	45	-47
	Payette	2003	60	32.5	-46
	Sawtooth	2003	15.7	6	-62
	Caribou	2003	6	2.8	-53

4/ Million board feet
(Data from Boise, Caribou, Payette, Sawtooth and Targhee Forest Plans)

Estimates of expected timber offer and harvest quantities are provided in the Environmental Consequences section as effects described under each alternative.

National Forest Timber Harvest – Timber harvest is the process by which trees with commercial value are cut and removed from the forest. Timber sale refers to a contractual process of selling the timber to a purchaser and implementing a series of harvesting requirements for what type, how and when the trees are removed. For purposes of this analysis, these terms are used interchangeably.

Timber sales are often used as a least-cost method (revenue is returned to the Federal treasury to offset the costs of preparing and carrying out the timber harvest) of managing vegetation to meet resource objectives or to achieve desired ecosystem conditions. These objectives or desired conditions include improving wildlife habitats, reducing fuels that may increase fire risk, recovering timber value from natural disasters, such as windstorm or fire, reducing impact of insect

and disease, and improving tree growth in addition to producing timber from the national forests.

Roads are required to support a timber sale, and frequently they must be constructed or reconstructed to meet timber harvest or other resource management objectives. Roads are needed to move equipment into the area and to haul logs or other forest products to the community where they will be processed. While timber can be harvested using helicopters or cable yarding systems from existing roads, the use of these methods depends on the value of the timber being removed, the terrain, and the distance to an existing road. Each timber sale contract specifies the yarding method and any permanent or temporary road construction and reconstruction required.

Timber purchasers may be required to complete needed road reconstruction to ensure public safety and to mitigate the damage to the environment from logging traffic. When the Forest Service determines that roads are needed for other multiple-use activities, the roads are constructed to meet appropriate road specifications and retained for future use after the timber sale. By law (16 USC 1608 (b)), temporary roads are used only for the duration of the timber sale and then closed, decommissioned or converted to a classified road. Even helicopter sales may require some classified road construction, reconstruction, or temporary road construction to access landings for hauling logs.

Road spacing and distance from the nearest road have a direct effect on yarding costs of wood fiber. As the road spacing or distance from the nearest road increases, so does the average yarding distance for a given harvest unit. This affects turn speeds and production rates which affect yarding costs. Frequently, the edge of a harvest unit furthest from the road reflects the maximum external yarding distance. External yarding distance dictates the size class of the yarding equipment needed to retrieve the material. This in turn determines the road width needed for that size equipment. Generally, wider road spacing means longer yarding distances, which requires larger yarders and wider road widths. The location of a road is particularly important in an area planned for cable logging. Roads located at the break (where the side slope changes from gentle to steep) provide better cable deflection, which results in larger payloads and less ground disturbance. (USDA Forest Service 1999).

The trend in silvicultural practices is shifting away from traditional even-aged management to even-aged management with leave trees, two-aged management, and uneven-aged managed stands. This is primarily due to public controversy and management concerns about non-timber resources. These multi-story and multi-age stands often require thinning and other silvicultural treatments with greater frequency, thus needing road access more often. Thinning to remove excessive forest fuels, before using prescribed fire, or to treat diseased or insect infested stands is often economically feasible only if a road system is present

(USDA Forest Service 1999c). From 2002 to 2006, clearcutting on Idaho's national forests accounted for only 7% of the total cutting method used on the 49.6 thousand acres harvested (USDA Forest Service, Intermountain & Northern Region data bases, 2007). This level is expected to continue into the future.

Inventoried Roadless Areas - There are approximately 9.3 million acres of inventoried roadless area within the National Forest System in the state of Idaho. Since 2001, these areas have been managed under the 2001 Roadless Rule. See Chapter 2, alternatives considered in detail, for a description of when timber cutting and harvest is allowed.

Roadless Areas Timber Harvest Trends – From 2001 to 2006, national forests in Idaho sold 279 MBF from inventoried roadless areas. This is less than 1% of the average annual volume sold from all national forests during the same period. This harvest amount represents the volume sold while implementing the 2001 roadless rule.

FOREST HEALTH - INSECTS AND DISEASE

Insect and disease populations can fluctuate base upon a number of circumstances, including warm and dry weather conditions, low vigor trees due to overcrowding, and trees damaged by fires. Frequently, several factors combine to weaken trees and increase their risk to insect and disease damage.

All forest trees in Idaho are subject to certain insect and disease agents. Most are native, with the exception of white pine blister rust, an introduced exotic. Insects and disease conditions become a forest health concern when they operate outside of their historical references, usually in response to changes in the forest composition and structure. Insects and disease require suitable hosts (e.g. tree species, size, forest structure) to successfully attack and damage trees. Climate and weather conditions can trigger or exacerbate outbreaks and intensify mortality. Because insects and disease require certain forest types and conditions to operate successfully, usually a landscape with appropriate tree species, of varying age and structure, are considered more resilient to large-scale outbreaks and mortality. Management options vary by agent, but usually include silvicultural options (thinning to reduce density, establishment of non-host trees, change in stand structure), preventative controls (e.g. tree spraying) or suppression activities.

Risk Mapping - In 1996, the Forest Service initiated a mapping effort to evaluate forest health risk on all forested lands in the United States. A geographic information system database was created that displays NFS lands most at risk of mortality from insects and diseases. It is used in combination with fire regime condition class layer (see fire/fuels report) to help set priorities at the national scale for addressing forest health problems (Lewis 2000). The forest health

composite map was updated using the 2006 insect and disease risk map (USDA Forest Service, 2007h). The 2006 risk map is used in this report.

Approximately 3.5 million acres of forestland in Idaho are estimated to be at risk to serious insect and disease mortality. The most recent estimates include over 1.4 million acres within roadless areas where 25% or more tree mortality can be expected over the next 15 years. It should be noted that the predicted risk for the state and the inventoried roadless areas are approximately the same, from 16% to 15%, respectively.

The forest cover types described earlier in this document are susceptible to a suite of insects and diseases. The forest types most susceptible to damage by insect and/or disease agent include (USDA Forest Service 2004, 2005, 2006b):

Douglas-fir Cover Type – Forests composed of Douglas-fir are subject to a wide variety of damaging agents that may cause extensive damage. In north Idaho (north of the Salmon River), Douglas-fir is very susceptible to mortality from root disease. Douglas-fir bark beetle often interacts with disease, fire and low vigor trees to increase populations. During outbreaks, the bark beetle can cause substantial mortality on the landscape, particularly in larger diameter trees, even those appearing to be healthy. Recent outbreaks have been associated with wildfires, particularly after the severe wildfires of 2000. Recent estimates indicate that populations are declining due to moist conditions that returned in 2005. However, because of the large amount of Douglas-fir cover type and stand structures susceptible to the beetle, risk of future outbreaks remains. Western spruce budworm can create heavily defoliation, and repeated infestations create mortality. Forests south of the Salmon River are currently experiencing increasing budworm infestations.

Lodgepole Pine Cover Type – The mountain pine beetle continues to be the most damaging bark beetle in Idaho. Lodgepole pine forests are particularly susceptible when trees reach an average diameter of 8 inches, 80 years old and relatively high densities. Mortality levels have exceeded 2.5 million trees as recently as 2002. Recent estimates indicate lower mortality figures, and in some areas the beetle populations may be decreasing as suitable host trees become limited.

Whitebark Pine Cover Type – although this cover type is restricted to cold environments in Idaho, limiting its extant, whitebark pine is an important species ecologically. Recently, the combination of mountain pine beetle infestations and white pine blister rust has created substantial mortality in larger diameter, cone bearing trees. Recent surveys in North Idaho have inventoried blister rust infection rates of up to 90% in regeneration as well.

Grand Fir Cover Type – Grand fir forests have been experiencing increased infestations by western spruce budworm. The Fir Engraver bark beetle has recently declined in population, but as recently as 2002 and 2003 surveys was

estimated to have killed between 120 to 130 thousand trees in Idaho. Much of this mortality was in Grand fir forests.

Subalpine Fir Cover Types – Western spruce budworm, fir engraver and western balsam bark beetle are considered threats to subalpine fir trees. Older trees are particularly susceptible to mortality. The balsam bark beetle has declined recently with increasing precipitation in the last few years, however, trees affected in 2002 and 2003 averaged approximately 150 trees thousand killed within the state. Increasing populations are occurring in southern Idaho.

Aspen decline – single causal agent for aspen mortality have not been identified. Rather, a combination of disease, insects and droughty conditions appear to be responsible.

Table 5 displays the estimated acres infested by principal damaging agent as recorded from aerial detection flights, 2002-2003, and 2005-2006.

Table 5. Principal insect and disease damaging agents in Idaho, as recorded from aerial detection flights, affected acres 2002-2006.

Damage Agent	Acres Affected (thousands)			
	2002	2003	2005	2006[1]
Mountain Pine Beetle	339.3	344.4	519.5	307.3
Ips Beetle	1.2	3.8	nd[2]	nd
Western Pine Beetle	8.6	16.7	nd	1
Spruce Beetle	.5	.8	Nd	nd
Douglas-fir Beetle	52.8	49.2	47.1	14.3
Fir Engraver	112	152.1	56.8	12.9
Western Balsam Bark Beetle	74.8	99.4	86.5	40.8
Western Spruce Budworm	82.2	160.2	137.3	281
Aspen Decline	nd	nd	9.8	nd

[1] *Incomplete data; not all areas were surveyed in Idaho. Underestimates of areas affected*
[2] *No data collected*

FOREST HEALTH - NOXIOUS WEEDS

Although the exact acreage is unknown, it is estimated that over 8 million acres of Idaho lands are severely infested by one of the state designated weeds in 1999 (IDSA, 1999). Currently, there are 57 listed noxious weed species in the state of Idaho. Noxious weeds can influence ecosystem health in several ways. Noxious weeds contribute to declining native plant communities by (USDA Forest Service, 2000):

- Decline in aquatic-riparian and terrestrial habitat for wildlife;

- Reduction in forage for grazing;
- Potentially increasing water runoff, sediment delivery, and soil erosion;
- Potential decline in water quality;
- Reduction in biological diversity;
- Negative impacts in native plants associated with American Indian tribal interests or rights, and;
- Increase costs associated in maintaining quality of recreation.

Noxious weeds become established where suitable environments exist. Frequently, suitable habitats are created by soil disturbance where native vegetation is temporarily and weeds invade the site. Even intact ecosystems without disturbance, such as bunchgrass ecosystems, can be invaded successfully by certain species of noxious weed.

Areas such as road cut and fills, mining, timber harvest sites, and gravel pits can serve as long-term vectors that aid the spread of noxious weeds.

Noxious weeds can spread through many mechanisms, including motor vehicles, other off-road motorized equipment, wildlife, livestock and humans. Once established, noxious weeds can be very difficult and expensive to control, and almost impossible to eradicate. Chemical, cultural, mechanical and biological control methods are available for control measures, effectiveness depending on the targeted weed species. Table 6 displays the reported infestations of noxious weeds as of June, 2007 for the national forests within Idaho and adjacent lands.

Table 6. Acres of noxious weeds, as reported to Idaho State Department of Agriculture, by National Forests (2007). Not all weed infestations have been reported.

Forest	Acres of Noxious weeds Reported to ISDA	Major Weed Species (1 thousand acre infestations or more)
Boise	4,551	Leafy Spruge
Caribou	18,725	Canada Thistle, Dyers Woad, Musk Thistle
Clearwater	1,394	Meadow Hawkweed
Idaho Panhandle	105	-
Nez Perce	87,410	Spotted Knapweed, Yellow Starthistle, Rush Skeletonweed
Payette	7,142	Rush Skeletonweed
Salmon Challis	102,321	Spotted Knapweed, Rush Skeletonweed, Musk Thistle
Sawtooth	155	-
Targhee	1,288	-
National Forest Total	**223,091**	-
Other Ownership	73,266	Spotted Knapweed
Total Acres (National forest and other ownership)	**296,356**	-

Over 28 thousand acres of infested with noxious weeds exist in inventoried roadless areas. This is approximately .3% of the inventoried roadless acres, compared to 1% considering all national forest system lands. However, it should be noted that not all inventoried roadless areas, and national forests have been surveyed for noxious weeds and reported to the ISDA database.

CARBON STORAGE AND CLIMATE CHANGE

Coniferous forests contain large amounts of carbon, stored as biomass both in the above ground biomass, and soil component (Smith et al. 2004). Forests accumulate carbon through the process of photosynthesis, the conversion of sunlight and water to carbon. Because the majority of forest ownership is on national forest lands in Idaho, national forests are an important source for carbon storage.

Forests in the United States are thought to have been in approximate carbon balance from 1600-1800. A large pulse of carbon release occurred during the 1800's, largely due to utilization of forests (cutting) and land conversions, primarily to agricultural uses. The last century saw a re-growth of forests that were harvested and the re-establishment of forests on abandoned agricultural lands. This resulted net carbon storage, even while intensive harvesting practices were occurring simultaneously. In the west, the effects of fire suppression are thought to been a contributor to this increase (Bridsey et al. 2006). This sequence of events was more prevalent in the east and south United States than the west, including Idaho. Current forest carbon density in Idaho is estimated to range from 36 to 45 tons/acre. Carbon storage is thought to be increasing on Idaho forestlands from 0 to .4 tons per acre as recently as 2005 (Woodbury et al. 2007).

Forests that have stand-replacing fire regimes can change amount of carbon released in the atmosphere. Stand replacing fires switch forest ecosystems from a carbon sink to a net source of carbon to the atmosphere as decomposition exceeds photosynthesis. One study in Yellowstone National Park indicated that equilibrium values of carbon storage were resistant to large changes in fire frequency (intervals between fires), due to current long fire intervals, rapid regeneration of trees, most rapid changes in carbon storage occurs in the first century following fire and carbon storage is similar for stands of different ages. However, modeled conversions of vegetation states from forests to non-forest vegetation could have a large impact on landscape carbon storage, and this process is likely to be important for many forests (Kashian et al. 2006).

Global climate change effects on forest types and species distribution has become an important issue as the warming of the global climate has become indisputable (Thomas et al. 2001; Walher et al. 2002; Parmesan and Yohe 2003; Root et al. 2003). Forest Service research results from one analysis predicted that existing forested ecosystems and their constituent species are projected to change in

spatial location, extant, and abundance in the western United States, including Idaho (Rehfeldt et al. 2006).

Exact magnitude and rapidity of climate change is uncertain, especially at finer scales such as landscapes within a forest. General conclusions in the western United State include temperature and precipitation increases, but also high variability in annual precipitation, including severe drought (Fenn et al. 2006). Modeling indicates the importance of the periodicity of precipitation and of the interactions between temperature and precipitation controlling the distribution of plant communities and their species. Finer scale modeling of potential climate change effects on vegetation is needed (Rehfeldt et al. 2006).

Environmental Consequences

See chapter 2 of the Draft EIS for a description of the alternatives, including the proposed action (Idaho Roadless Petition).

Timber Harvest and Cutting

2001 Roadless Rule - Indirect Effects

Under the 2001 Roadless Rule, timber harvest in inventoried roadless areas would be prohibited except as provided by the exceptions listed in chapter 2. Road construction /reconstruction would not occur in support of harvest or cutting. These restrictions are similar to the Backcountry/Restoration theme of the Idaho Roadless Petition.

Timber harvest objectives within inventoried roadless areas are restricted to those that maintain or improve one or more of the roadless characteristics, generally remove small diameter trees, and meet the exceptions listed in chapter 2. Both even-aged and uneven-aged management may be used, with even-aged regeneration systems generally shelterwood harvests. Intermediate harvests could occur with either system. The focus on restoration of habitat and ecosystems would drive harvest prescriptions, and the retention of structure and canopy coverage would be retained in each unit in varying degrees. The result of these prescriptions would be a more natural appearance of the forest types treated with their adjacent plant communities, especially as plant succession occurs over time.

Helicopter yarding would be the principal yarding method under this alternative. Ground base and cable yarding would only occur adjacent to existing roads. Because of the cost associated with helicopter yarding, combined with the applicable restrictions for timber harvest discussed above, this alternative is projected to have the least average yearly harvest removals of all alternatives considered, projected from 2007-2011, averaging 500 thousand board

feet a year. This amount of harvest volume is .4% of the average harvest on all national forest lands that occurred from 2002-2006.

Annual harvest acres are projected to average approximately 100 acres per year or 1,500 acres over 15 years. This is minute fraction of the total inventoried acres, even over the next 15 years. Compared to the average harvest acreage on all national forest lands in Idaho from 2002-2006, this amount is approximately 1 percent of the annual total harvest. Compared to average state-wide harvests (including both private and other public lands), the amount of harvested volume and acres would be the least of all alternatives.

Harvesting and other timber cutting costs are highest under this alternative. This is due to lack of road access and the lower expected return from cutting smaller diameter trees in harvested areas.

Acres treated to meet the objective of limiting uncharacteristic or unwanted wildfires by timber harvest would most likely be confined to the WUI. Other treatment methods, such as prescribe burning, would be relied upon to a greater extent when compared to other alternatives. The least amount of areas of insect and disease, or overall forest health acres, could be treated through timber harvest with this alternative.

Existing Forest Plans

Timber harvest objectives within inventoried roadless areas are governed by the management prescriptions of Existing Forest Plans. Management prescriptions similar to the General Forest theme generally allow areas to be managed for timber production. Road construction/reconstruction is allowed to support timber harvest and cutting, and roadless area characteristics would not have to be maintained. Harvest and timber cutting may be used to address a variety of issues, and there are no restrictions on the type of silvicultural tools available to achieve them. However, it is likely that residual stand structure would be retained commensurate with the objectives to be achieved through harvest and cutting. Both even-aged and uneven-aged management may be used. Intermediate harvests could occur with either system. Prescriptions would not have to maintain roadless characteristics. Since the frequency of harvest would be greatest with this management theme, and the amount of acres allocated under Existing Forest Plans is greatest for this alternative, the result of these prescriptions would be more evident over time on the forest types treated on the landscape.

Management prescriptions similar to the Backcountry/Restoration theme would be managed similarly and have the same effects as that described for the 2001 Roadless Rule. However, rather than the entire 9.3 million acres of inventoried roadless areas managed as Backcountry/Restoration, approximately 4.2 million

acres of the Existing Forest Plans would be under the Backcountry/Restoration theme.

The Primitive theme restricts timber harvest and cutting similar to Backcountry/Restoration areas, usually in response to a threat. Since road construction and reconstruction associated with timber is not allowed, and only existing roads can be used, the costs of harvesting or cutting timber is substantially higher than General Forest areas. Furthermore, the objective of providing primitive recreation opportunities and maintaining roadless characteristics, combine with the high costs, would rarely permit harvesting and tree cutting to occur. The evidence of timber harvest would be even less than those associated with the Backcountry/Restoration theme.

A mix of yarding systems would be used under this alternative. Ground based and cable yarding would mostly be used in the General forest, mostly helicopter in the Backcountry/Restoration and Primitive themes. This alternative is projected to have an approximate annual average of 14 MMBF harvested from 2007-2011, the most average yearly harvest removals of all the alternatives considered. Road construction and reconstruction associated with timber harvest would average 11 miles yearly, mostly in the General Forest theme. This amount of harvest volume is 11% of the average harvest on all national forest lands that occurred from 2002-2006.

Annual harvest acres are projected to average approximately 2,800 acres per year or 42,000 acres over 15 years. This is about .5% of the total inventoried acres over 15 years. Compared to the average harvest acreage on all national forest lands in Idaho from 2002-2006, this amount is approximately 28 percent of the total annual harvest acres. Compared to recent average state-wide harvests (including both private and other public lands), the amount of harvested volume and acres would be the most of all alternatives.

Harvesting and other timber cutting costs are lowest under this alternative. This is due to the ability to build roads that are associated with timber harvest and the higher expected return due to decreased yarding costs.

Acres treated to meet the objective of limiting uncharacteristic or unwanted wildfires would be more likely to occur both within and outside of the WUI, as necessary to support strategic fuel treatments. More acres that are designed to treat insect and disease problems, and overall forest health, could potentially occur under this alternative.

Idaho Roadless Petition

Timber harvest objectives within inventoried roadless areas are governed by the management themes of the Idaho Roadless Petition. See Chapter 2 of the draft EIS for a full description of the acres that are similar in management as those described with the Idaho Roadless Petition.

Less acres are managed under General Forest theme by the Idaho Roadless Petition than under the Existing Forest Plans. Similar harvest prescriptions and road construction/ reconstruction activities are allowed. Because this theme permits a full range of silvicultural harvest and cutting methods, the evidence of effects of these activities would be more evident than the other themes. However, since fewer acres are managed under this theme as compared to the Existing Forest Plans, over the landscape as a whole, the evidence of activity is less.

The combination of General forest, Backcountry/Restoration and Primitive themes (where timber harvest and cutting is allowed under varying circumstances), this alternative is projected to have an approximate annual average of 4 MMBF harvested from 2007-2011. Road construction/reconstruction associated with timber harvest would average 3 miles yearly. This amount of harvest volume is 3% of the average harvest on all national forest lands that occurred from 2002-2006.

Annual harvest acres are projected to average approximately 800 acres per year, or 12,000 acres over 15 years. This is about .1% of the total inventoried acres over 15 years. Compared to average harvest acreage on all national forest lands in Idaho from 2002-2006, this amount is approximately 8 percent of the annual harvest acres. Compared to recent average state-wide harvests (including both private and other public lands), the amount of harvested volume and acres would be intermediate of all alternatives.

Other Indirect and Cumulative Effects on Timber Harvest

Past and Present-Timber trends - Idaho National Forests contribution to the state's harvest level has declined steeply since the early 1990's. It appears that national forest harvests state-wide have stabilized around 120 million board feet per year in the first-half of this decade.

Suitable lands and ASO – Revised plans in recent years have shown a decreasing trend in both suitable acres and ASO. It is reasonably foreseeable that this trend will continue with the 3 plans currently under revision (Clearwater, Idaho Panhandle and Nez Perce).

Old growth forests (late successional) will be managed as described under individual forest plans on national forest lands in Idaho. This includes all of the inventoried roadless acres. Further, other laws, such as the Healthy Forests Protection Act (HFRA), contain provisions for management of old growth stands, including a review of pertinent scientific information concerning potential treatments. This review would occur when HFRA projects are developed (HFRA, Section 102(e)(2)(3)(4), 2003).

Present Actions – NFS lands contribute approximately 5% of the nation's total timber harvest from all ownerships (USDA Forest Service, 2000). In the face of

stable or increasing per-capita consumption in the United States, the effect of the shift to ecological sustainability on United States public lands has been to shift the burden and impacts of that consumption to ecosystems somewhere else – to private lands in the United States or to lands of other countries (MacCleery, 2000). This shift has occurred in Idaho as well. Considering the alternatives, the 2001 Roadless Rule will add more burden of this shift, as compared to the Existing Forest Plans and Idaho Roadless Petition. However, compared to the national and state-wide harvests on all land ownerships, the volume anticipated from roadless areas is very small considering all of the alternatives.

Reasonable Foreseeable Actions – It's reasonably foreseeable that wildfires will continue to occur on NFS lands, including inventoried roadless areas. Salvage harvest is frequently a priority for harvest due to both social and economic reasons. The occurrence of such events may shift individual national forests programs to concentrate on the sale and harvest of salvage material. To the extent that this volume occurs, some increase in timber offer volume may occur for several years, likely decreasing in subsequent years as the sale program re-adjusts to the regular planned program.

While national lumber consumption is expected to increase in the future (USDA Forest Service, 1999), the volume harvested on NFS lands in Idaho is not expected to increase substantially to fill this need. Other timber producing lands in Idaho are not likely to increase in the future either, based upon the harvest trends since the early 1990's. This would mean that increase harvests would need to come from a combination of harvest in other areas of the U.S., or imports from other nations.

FOREST HEALTH – INSECTS AND DISEASE

2001 Roadless Rule

Under this alternative, timber harvest not requiring road construction and reconstruction would be used to treat forest health improvement objectives (e.g., suppressing insect infestations, reducing the spread of disease, thinning to improve vigor, and fuels reduction). Fewer acres of forest health treatment would be accomplished under this alternative (compared to the Existing Forest Plans and Idaho Roadless Petition) through timber harvest because treatment cost per acre would be substantially higher due to the road construction prohibition and lower timber harvest acreage projections. About 1,500 acres are projected to be treated over the next 15 years.

Forest health objectives would have to be completed using other means than timber sale contracts, which would require appropriated funds. However, due to the lack of access, timber cutting (exclusive of timber sales) that are designed to meet forest health objectives are likely to be minimal because of lack of access and the associated high cost of treatment, and general over-all constraint on

appropriated funds available for such work. This would mean that almost all of the acres identified to incur more than 25% mortality or significant growth loss over the next 25 years would remain untreated.

Existing Forest Plans

Under this alternative, timber harvest and road construction/reconstruction would be used, consistent with forest plan direction, to treat a portion of the high priority forest health improvement objectives (e.g., suppressing insect infestations, reducing the spread of disease, thinning to improve vigor, and fuels reduction) in management prescriptions similar to the General Forest and Backcountry/Restoration themes. Most acres of forest health treatment would be accomplished under this alternative (compared to the 2001 Roadless Rule and Idaho Roadless Petition) because more acres are in the General Forest theme than the Idaho Roadless Petition, and road construction reduces the cost of treatment as compared to the other themes that do not allow roads.

Of the 1.4 million acres at risk to insect and disease mortality, approximately 187,000 acres are within the General Forest theme and 731,000 acres are in the Backcountry theme. This provides more opportunities to treat high priority insect and disease areas through timber harvest, since up to 42,000 acres are projected to be harvested under this alternative over the next 15 years.

The ability to construct roads with timber harvest within General Forest, and in some areas in the Backcountry theme, also reduces the cost of other methods (e.g. timber cutting exclusive of timber harvest and mechanical) that may contribute to forest health objectives. However, this would still require the use of appropriated funding that is currently scarce for such projects.

It is unlikely that any substantial impact would occur on forest health conditions over the short-term. However, over the longer-term, considering the amount of General Forest and Backcountry lands projected for timber harvest, this alternative is likely to be the most effective in addressing forest health concerns in the roadless areas.

Idaho Roadless Petition

Under this alternative, the General Forest, Backcountry/Restoration and Primitive management themes would permit, in descending order of frequency, some level of timber cutting that could treat a portion of the acres identified as high risk to insect and disease mortality.

The areas identified within the General Forest theme would likely have the most potential to be treated, since both timber harvest and timber cutting are allowed, and road construction/reconstruction can occur. More acres of forest health treatment would be accomplished under this alternative than the 2001 Roadless Rule, but less than Existing Forest Plans). The Backcountry/Restoration and

Primitive themes are less likely to be treated because of increase costs, and management theme direction. Some road construction/reconstruction would be permitted in the Backcountry theme to maintain or restore ecosystem composition and structure or to reduce the significant risk of wildland fire effects. The principal objective is to protect at-risk communities and municipal watersheds, as well as to address (1) areas where wind throw, blowdown, ice storm damage, or the existence or imminent threat of insect and disease epidemic is significantly threatening ecosystem components or resource values that may contribute to significant risk of wildland fire; or (2) where wildland fire poses a threat to, and where natural fire regimes are important for, threatened and endangered species or their habitat.

Of the 1.4 million acres at risk to insect and disease mortality, approximately 26,000 acres are within the General Forest theme and 939,000 acres are in the Backcountry theme. This provides some opportunities to treat high priority insect and disease areas through timber harvest, since up to 12,000 acres are projected to be harvested under this alternative over a 15 year period, most of which would occur in the General Forest theme and some in the Backcountry theme.

The ability to construct roads with timber harvest in General Forest, and to a limited degree in the Backcountry theme also reduces the cost of other methods (e.g. timber cutting exclusive of timber harvest and mechanical) that may contribute to forest health objectives. However, this would still require the use of appropriated funding that is currently scarce for such projects.

It is unlikely that any substantial impact would occur on forest health conditions over the short-term. However, over the longer-term, considering the amount of General Forest and Backcountry lands projected for timber harvest, this alternative is likely to be the more effective in addressing forest health concerns in the roadless areas than the 2001 Roadless Rule, but less than the Existing Forest Plans.

Other Indirect and Cumulative Effects on Insects and Disease

Past Actions – The combined incremental effects of wildland fire suppression and reductions in timber harvest from federal lands have led to a change in vegetation structure and species composition and an increasing accumulation of forest fuels over large landscapes of most of the interior West, including inventoried roadless areas (USDA Forest Service 2000). Average annual removal of timber from NFS lands in Idaho from 2002-2006 was approximately 20% of estimated growth for 2006 (USDA Forest Service 2007). This indicates an ongoing and substantial net increase in volume of wood fiber on NFS lands.

Present Actions - The primary cumulative impact of all alternatives, when added to other past, present and reasonably foreseeable future actions, is the continuing

change in vegetation structure and species composition, and the accumulation of vegetation and forest fuels. Prohibition of road construction/reconstruction under the 2001 Roadless Rule within inventoried roadless areas, and in all themes other than the General Forest and Backcountry themes for the Existing Forest Plans and Idaho Roadless Petition Alternatives, would result in a large proportion of inventoried roadless area acres remaining largely inaccessible (due to lack of economic feasibility) to equipment necessary to accomplish vegetation management for forest health objectives. Some of these lands are unsuitable for timber production; on other lands, road construction is not currently economically feasible. Most lands within one-quarter to one-half mile of an existing road would continue to be managed using timber harvest or other methods of treatment where appropriate. However, cost per acre would increase substantially and proportionally with distance of the project from the nearest road.

Total acres treated within inventoried roadless areas under the Backcountry/Restoration, Primitive themes are likely to be less than the General Forest theme. Trees inside these economically inaccessible portions of inventoried roadless areas that are killed by insects, disease, windthrow, or fire would deteriorate and add to fuel loading. Wildland fires that subsequently burn these areas may cause severe impacts to soil and water resources because higher concentrations of natural fuels would cause the fire to burn hotter. However, even if road construction/ reconstruction in inventoried roadless areas were permitted, it may not be possible to treat many of these acres because of resource concerns and the high cost of road construction (USDA Forest Service, 2000).

Reasonably Foreseeable Future Action - It is reasonably foreseeable that global climate change will have potential effects on fire frequency, severity and forest insect and disease relationships. Increased fire activity has been linked to effects of warming climate, as has certain insect infestations in the western United States and Canada (USDA Forest Service, 2007a). Depending on the magnitude of change, increased risk from insects and diseases could occur in Idaho forests. If this occurs, areas under the General Forest theme are more likely to be treated, whereas Backcountry/Restoration and Primitive themes are less likely to be treated.

FOREST HEALTH - NOXIOUS WEEDS

All alternatives

Wildfires are likely to continue in the roadless areas. Wildfires can create suitable habitat for noxious weeds and other invasive plants, especially those in the grasslands, shrublands and dry forest types (e.g. ponderosa pine and some of the Douglas-fir type). This can increase the potential for introductions of noxious weed and invasive plants, in addition to management activities described above.

It is reasonably foreseeable that global climate change will have potential effects on noxious weeds and fire frequency/severity. Increased fire activity has been linked to effects of warming climate (USDA Forest Service, 2007b). Depending on the magnitude of change, increased risk of noxious weed establishment could occur in Idaho forests, since fire temporarily removes native vegetation and can provided suitable conditions for noxious weed establishment, or expansion of existing populations. Additionally, future plant communities may become more or less susceptible to noxious weeds. However, due to the uncertainty of the actual climate conditions that may vary across the state, it is not possible to predict the actual outcomes at this time.

2001 Roadless Rule

This alternative would have the least potential for the spread of road-transported noxious weeds. This is due to the general road prohibition of road building with timber harvest. There would be some potential risk of the road building that potentially could occur for other reasons, such as valid existing rights. About 15 miles of road are projected to be constructed/reconstructed over the next 15 years.

Existing Forest Plans

This alternative would have the highest likelihood of introducing and spreading road-transported noxious weeds and other invasive species. This is due to the higher projected timber harvest acres and road construction/reconstruction miles, and the most amount of General Forest as compared to the other alternatives. Survey records (ISDA, 2007) indicate that of the 1.26 million acres of General Forest about 8,313 acres of noxious weeds have been found. About 180 miles of road construction/reconstruction are projected to occur over the next 15 years. Since more General Forest acres exist under this alternative as compared to the Idaho State Petition, their is more potential for these populations to expand due to management activities. Intensity of harvest removal is also likely to be higher in this alternative. Areas within General Forest themes would have the most potential for introduction and spread, followed by Backcountry/Restoration and then Primitive themes.

Any increase in mineral or geothermal development could potentially increase the introduction of weeds, due both to road access needs and to the disturbance at the individual sites themselves. It is anticipated that best management practices, including appropriate weed treatment strategies, would be used to mitigate this potential adverse impact.

Idaho Roadless Petition

This alternative would have more potential than the 2001 Roadless Rule of introducing and spreading road-transported noxious weeds, but less than

Existing Forest Plans. This is due to the higher projected timber harvest acres and the ability to build roads in the General Forest theme than the 2001 Roadless Rule, but less projected harvest acres and road construction/reconstruction miles as compared to the Existing Forest Plans. Survey records (ISDA, 2007) indicate that 2,635 acres of noxious weeds have been inventoried in General Forest. About 60 miles of road construction/reconstruction over 15 years are projected to occur. Since less General Forest acres exist and less road construction/reconstruction is projected under this alternative as compared to Existing Forest Plans, their is less potential for these populations to expand due to management activities. However, using the same reasoning, there is more potential for noxious weed populations to expand than the 2001 Roadless Rule. Areas within General Forest themes would have the most potential for introduction and spread, followed by Backcountry/Restoration and then Primitive themes.

CARBON STORAGE AND CLIMATE CHANGE

Environmental consequences for effects of the alternatives on carbon storage and climate change are presented within the framework of two competing strategies: conservation and active management. Active Management would include adaptive responses as additional information on this subject is accumulated, and monitoring results of actual management effects are evaluated.

Conservation strategies include reserve networks that generally promote natural processes. As it relates to carbon storage and climate change, this would include permitting plant communities and their species to be allowed to adapt to the changing circumstances, relying on evolutionary processes to control re-assemblage of species, genotypes within species, with the new climatic conditions presented. This approach includes advocates such as Noss (2001).

Active (adaptive) management strategies would generally promote human intervention to mitigate climate change effects and proactively participate with evolutionary process through management (Tchebakova et al. 2005). It should be noted, that due to the uncertainty and complexity of the effects due to climate change, predictive models pinpointing locations where plant communities and species can be sustained will need to be developed (Rehfeldt et al. 2006).

This evaluation of effects is in line with the general scenarios presented under the Columbia River basin analysis in 1997 (Quigley et al., 1997).

2001 Roadless Rule

The 2001 Roadless is the most similar to the conservation strategy, with modifications that include seven exceptions for road construction/reconstruction and 4 exceptions for timber harvest and cutting. One of the exceptions does include restoration of ecosystems, so this alternative does allow some human management. However, due to the lack of access anticipated due to limited road

development, restoration costs could potentially be the highest considering all alternatives. Only about 1,500 acres are projected to be actively treated for restoration purposes over the next 15 years. Most of the inventoried roadless areas plant communities and species would be allowed to re-adjust to the changing climatic conditions without human intervention.

Existing Forest Plans

Existing forest plans more closely align with active management strategies. This is due to the potential access provided considering management opportunities present under the General Forest theme. Providing access through road construction/reconstruction should reduce the cost of potential restoration activities. About 42,000 acres are projected to be harvested over a 15 year period, generally to restore ecosystems or reduce fire risk. Although more of the inventoried roadless areas plant communities and species could potentially benefit from active management, most of the acres would not likely be available for management considering the amount of acres that are in management prescription similar to Backcountry/Restoration, Primitive, Special Areas of Historic and Tribal Significance and Wild Land Recreation themes. Plant communities and species within those themes would most likely be allowed to re-adjust to the changing climatic conditions without human intervention.

Idaho Roadless Petition

This alternative incorporates both passive and active management strategies. Passive management strategies are reflected in the Wild Land Recreation, Primitive and Special Areas of Historic and Tribal Significance. Active management is reflected in the General Forest theme and to a lesser degree in the Backcountry/Restoration theme. About 12,000 acres over 15 years are projected to restore ecosystems or reduce fire risk. Most of the plant communities and species within Backcountry/Restoration, Primitive, Special Areas of Historic and Tribal Significance and Wild Land Recreation themes would most likely be allowed to re-adjust to the changing climatic conditions without human intervention.

Other Indirect and Cumulative Effects on Carbon Storage and Climate Change

Reasonable Foreseeable Actions – It is reasonably foreseeable that global climate change will have potential effects on fire frequency, severity and forest insect and disease relationships. Increased fire activity has been linked to effects of warming climate, as has certain insect infestations in the western United States and Canada (USDA Forest Service, 2007a). This could potential lead to increase emissions of carbon dioxide and other greenhouse gases from wildfires and possibly to decrease stored carbon in western forests and rangelands (USDA Forest Service, 2007b).

In a general sense, as long as fire-affected ecosystems recover at the same rate as fires consume biomass and surface fuels, the net effect of fire on the carbon in the atmosphere or stored in ecosystems will be approximately neutral. If the frequency, extent or severity of fire increases due to changing climate or management practices, then terrestrial carbon storage will decrease, and the carbon in the atmosphere will increase (USDA Forest Service, 2007b).

Under a changing climate, the trajectories of vegetation recovery after fire may also change, leading to different potentials for ecosystem carbon storage. The exact mechanisms and magnitude of this change are still under research (USDA Forest Service, 2007b).

Future research, combined with effective strategies that include increased carbon storage capabilities, could help offset the increase in greenhouse gases. These strategies could also address climate change effects of national resources (USDA Forest Service, 2007c,d,e,f,g). These strategies have yet to be developed.

REFERENCES

Birdsey, R.; K. Pregitzer; A. Lucier. 2006. Forest carbon management in the United States: 1600–2100. Journal of Environmental Quality. 35: 1461–1469. http://www.fs.fed.us/ne/newtown_square/publications/other_publishers/ne_2006_birdsey002p.pdf. (Accessed October 27, 2007).

Fenn, M.E. 2006. The effects of nitrogen distribution, ambient ozone, and climate change on forests in the Western U.S. Proc. September 20-24, 2004, Denver, CO. RMRS-P-42CD. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 8 p. http://www.fs.fed.us/rm/pubs/rmrs_p042/rmrs_p042_002_008.pdf. (Accessed October 26, 2007).

Idaho Department of Agriculture. 2007. Noxious weed inventory GIS layer. Unpublished database. (Accessed May 16, 2007).

Idaho Department of Agriculture. 1999. Idaho's strategic plan for managing noxious weeds. Boise, ID. 11 pp. http://agri.idaho.gov/Categories/PlantsInsects/NoxiousWeeds/Documents/general/stratplan.pdf (Accessed November 2, 2007).

Kashian, D.M.; W.H. Romme; D.B. Tinker; M.G. Turner; M.G. Ryan. 2006. Carbon storage on landscapes with stand-replacing fires. BioScience. 56(7): 598–606. http://www.bioone.org/archive/0006-3568/56/7/pdf/i0006-3568-56-7-598.pdf. (Accessed October 26, 2007).

Lewis, J.W., 2000. Mapping risk from forest insects and disease. Washington, DC: U.S. Department of Agriculture, Forest Service. http://www.srs.fs.usda.gov/sustain/conf/abs/lewis.htm. (Accessed October 27, 2007).

MacCleery, D.W.; D.C. Le Master. 1999. The historical foundation and evolving context for natural resource management on Federal lands. In: Szaro, R.C.; N.C.

Miles, P.D. **2007**. Forest inventory mapmaker web-application version 2.1. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. http://www.ncrs2.fs.fed.us/4801/fiadb/index.htm. (Accessed June 07, 2007).

Morgan, T.A., C.E. Keegan, III, T.P. Spoelma, T. Dillion, A.L. Hearst, F.G. Wagner, L.T. Deblander, 2004. Idaho's forest products industry: a descriptive analysis. Resource. Bull. RMRS-RB-4. Fort Collins, Co. USDA Forest Service, Rocky Mountain Research Station, 31 p. http://www.treesearch.fs.fed.us/pubs/7611 (Accessed November 2, 2007)

Noss R.F. 2001. Beyond Kyoto: forest management in a time of rapid climate change. Conservation Biology. 15: 578–590. http://www.blackwell-synergy.com/doi/pdf/10.1046/j.1523-1739.2001.015003578.x. (Accessed October 26, 2007).

Parmesan C.; G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature. 421: 37–42. http://www.nature.com/nature/journal/v421/n6918/full/nature01286.html. (Accessed October 26, 2007).

Quigley, T.M.; S. Arbelbide, 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: USDA Forest Service, Pacific Northwest Research Station, volume II: 394, 629, 888, 890, 892. [1,055 p]. http://www.fs.fed.us/pnw/pubs/gtr405/pnw_gtr405az.pdf. (Accessed October 27, 2007).

Rehfeldt, G.E.; N.L. Crookston, M.V. Warwell, J.S. Evans, 2006. Empirical analysis of plant-climate relationships for the western United States. Int. J. Plant Sci. 167(6): 1123-1150.

Root, T.L.; J.T. Price; K.R. Hall; S.H. Schneider; C. Rosenzweig; J.A. Pounds. 2003. Fingerprints of global warming on wild animals and plants. Nature. 421: 57–60. http://www.nature.com/nature/journal/v421/n6918/full/nature01333.html. (Accessed October 27, 2007).

Ruefenacht, B., M.V. Finco, M.D. Nelson, R. Czaplewski, E.H. Helmer, J.A. Blackard, G.R. Holden, A.J. Lister, D. Salajanu, D. Weyermann, K. winterberger, In Press, 2007. Conterminous US and Alaska Forest type Mapping Using Forest Inventory and Analysis.

Smith, J.E.; L.S. Heath. 2004. Carbon stocks and projections on public forestlands in the United States, 1952–2040. Environmental Management .33(4): 433–442. http://www.fs.fed.us/ne/newtown_square/publications/other_publishers/ne_2004_smith002p.pdf. (Accessed October 27, 2007).

Tchebakova, N.M.; G.E. Rehfeldt; E.I. Parfenova. 2005. Impacts of climate change on the distribution of *Larix* spp. and *Pinus sylvestris* and their climatypes in Siberia. Mitigating Adaptive Strategies Global Change. 11: 861–882.

Thomas, C.D.; E.J. Bodsworth; R.J. Wilson; A.D. Simmons; Z.G. Davies; M. Musche; L. Conradt. 2001. Ecological and evolutionary processes at expanding range margins. Nature. 411: 577–581. http://www.nature.com/nature/journal/v411/n6837/full/411577a0.html. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007a. Climate change and forest pests. Research and Development Briefing Paper, January 29, 2007. Unpublished report. 2 p. http://www.fs.fed.us/psw/topics/climate_change/pdf/CC_forest_pests_012907.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007b. Interactions of fire, carbon, atmosphere, and changing climate. Research and development briefing paper, February 8, 2007. Unpublished report. 3 p. http://www.fs.fed.us/psw/topics/climate_change/pdf/CC_fire_carbon_atmo_020807.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007c. The case for developing an agency-wide integrated response to global change and its effects on forest and range ecosystems. In: Leadership team meeting briefing paper, New Orleans, LA, April 24, 2007: 1–2. Unpublished paper. http://www.fs.fed.us/rmrs/docs/climate-change/national-briefing-papers.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007d. Climate change impacts on U.S. water resources. In: Leadership team meeting briefing paper, New Orleans, LA, April 24, 2007: 11–12. Unpublished paper. http://www.fs.fed.us/rmrs/docs/climate-change/national-briefing-papers.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007e. Opportunities to increase carbon sequestration and reduce emissions for U.S. forest lands. In: Leadership team meeting briefing paper, New Orleans, LA, April 24, 2007: 5–6. Unpublished paper. http://www.fs.fed.us/rmrs/docs/climate-change/national-briefing-papers.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007f. Strategic planning for climate change research and management. In: Leadership team meeting briefing paper, New Orleans, LA. April 24, 2007: 7–8. Unpublished paper. http://www.fs.fed.us/rmrs/docs/climate-change/national-briefing-papers.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007g. Re-framing management strategies in the face of climate change. Leadership team meeting briefing paper, New Orleans, LA., April 24, 2007: 13–14. Unpublished paper. http://www.fs.fed.us/rmrs/docs/climate-change/national-briefing-papers.pdf. (Accessed October 27, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2007h. Insect and disease risk map: a multi-criteria framework for producing local, regional, and national insect and disease maps. http://www.fs.fed.us/foresthealth/technology/pdfs/threatsconf2006-krist-paper_v2.pdf. (Accessed October 27, 2007).

USDA Forest Service, 2006a. Forest Service Directives, Land Use Planning Manual 1900. 1905-2006-1, page 18.

U.S. Department of Agriculture [USDA], Forest Service. 2006b. Idaho forest health highlights 2006. http://fhm.fs.fed.us/fhh/fhh_06/id/Idaho06.pdf. (Accessed October 26, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2005. Idaho forest health highlights 2005. Ogden, UT. 4p. http://www.fhm.fs.fed.us/fhh/fhh-05/id/id_05.pdf (Accessed November 2, 2007)

U.S. Department of Agriculture [USDA], Forest Service. 2004. Idaho forest health highlights 2004. Ogden, UT. 2004. http://www.fhm.fs.fed.us/fhh/fhh-04/id/id_04.pdf (Accessed November 2, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 2000. Roadless rule final EIS, Forest Service roadless area conservation final EIS, volumes 1, 2, and 3. http://roadless.fs.fed.us/documents/feis/. (Accessed October 26, 2007).

U.S. Department of Agriculture [USDA], Forest Service. 1999. Roads analysis: informing decisions about managing the national forest transportation system. Miscellaneous Report FS-643. Washington, DC. 222p. http://www.fs.fed.us/eng/road_mgt/DOCSroad-analysis.shtml (Accessed November 2, 2007)

Walther, G.R.; E. Post; P. Convey; A. Menzel; C. Parmesan; T.J.C. Beebee; J.M. Fromentin; O.H. Hoegh-Guldberg; F. Bairlein. 2002. Ecological responses to recent climate change. Nature. 416: 389–395. http://www.nature.com/nature/journal/v416/n6879/full/416389a.html. (Accessed October 27, 2007).

Woodbury, P.B.; J.E. Smith; L.S. Health. 2007. Carbon sequestration in the U.S. forest sector from 1990 to 2010. Forest Ecology and Management. 241: 14–27. http://nrs.fs.fed.us/pubs/jrnl/2007/nrs_2007_woodbury_001.pdf (Accessed Oct 27, 2007)

Database References

USDA Forest Service, 2007. Annual Reforestation and Timber Stand Improvement Reports, 2002-2006. Intermountain Region. Data complied from RMRIS and FACTS database. http://www.fs.fed.us/r4/resources/timber/index.shtml (Accessed July 18th, 2007)

USDA Forest Service, 2007. Annual Reforestation and Timber Stand Improvement Reports, 2002-2006. Northern Region. Data complied from TSMRS and FACTS database. http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml#volume (Accessed June 7, 2007)

USDA Forest Service, 2007. Intermountain Region Cut and Sold Reports, 2002-2006. http://www.fs.fed.us/r4/resources/timber/index.shtml (Accessed June 11, 2007)

USDA Forest Service, 2007. Northern Region Timber Program Statistics, 2002-2006. http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml#volume (Accessed June 7, 2007)